Ethnobotany of Oshá (*Ligusticum porteri*) and Policy of Medicinal Plant Harvest on United States Forest Service Lands

By

Natasha Myhal

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Chair: Professor Kelly Kindscher

Professor Stephanie Fitzgerald

Professor Jay Johnson

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The thesis committee for Natasha Myhal certifies that this is the approved version of the following thesis:

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Chair: Kelly Kindscher

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Abstract

Oshá (*Ligusticum porteri*), found in high elevation sites in the southwestern United States and northwestern Mexico, is a medicinal plant whose roots are being sold by herbal product companies to treat influenza, bronchitis, and sore throat. Oshá and other medicinal plants have a long history of use within Indigenous communities, fifteen tribes are documented using oshá and those uses are practiced today and more tribes likely use oshá, especially in and near the range of the plant. Historically and today, tribes such as the Apache, Pueblo, Navajo, Zuni, White Mountain Apache, Southern Ute, Lakota, and the Tarahumara in Mexico used oshá to treat ailments such as to treat colds, flu, upper respiratory infection, and diarrhea and gastrointestinal problems. Another use of root is to repel snakes if one carries the root with them. Oshá is commonly referred to as bear root by Native American tribes because bears have been observed using and interacting with the root. Oshá is also considered sacred to some tribes and it is used outside its native range by hundreds of miles by the Comanche, Plains, Apache, and Lakota tribes. Interviews conducted with tribal elders, a Hispanic elder, U.S. Forest Service officials, and an herbal product company owner help to make suggestions for U.S. Forest Service policies, such as co-management strategies for medicinal plants like oshá. This paper also examines the potential areas of collaboration between Native tribes and current U.S. Forest Service policies to create future Native American focused policies and strengthen future relationships.

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Introduction to Thesis

Native Americans access to medicinal plants have diminished dramatically since colonization. Former tribal lands have been converted to private property, Forest Service lands, National Park lands, or federal lands, Native peoples' access to traditional medicinal plants have been blocked by various gate-keeping measures such as permits, increased federal regulations, and illegal harvesting. Also, popularity of herbal medicines across the globe have translated into increased competition for harvesting these medicinal plants by herbal product companies. Furthermore, Native American tribes and other Indigenous groups have continued to harvest and use medicinal plants despite land loss and removal onto reservations. Today medicinal plants are growing in popularity with both the general public and within Native communities.

The first chapter of my thesis is on the ethnobotany of the medicinal plant oshá (*Ligusticum porteri*), also known as bear root. This medicinal plant grows at elevations of 6,000 to 11,700 feet in the Rocky Mountains and Sierra Madre region in Mexico and is a perennial member of the Parsley family. Oshá is commonly used to treat common colds, flu, and gastrointestinal problems. In my ethnobotany chapter I discuss oshá as a sacred medicinal and cultural plant that fifteen tribes still use to this day. I would like to note that more than fifteen tribes that use this plant, but I was only able to gather information on that many for the scope of my research. Furthermore, Hispanic peoples and Indigenous peoples of Mexico also use oshá for similar purposes. In addition to gathering written ethnobotanical information, I was able to interview Native American elders, a Hispanic elder, U.S. Forest Service managers, and a herbal product company owner. All of those that I interviewed have knowledge of oshá, from ethnobotanical, cultural, management strategies, and oshá as an herbal product. I will discuss more about each interviewee in detail in my methodology section. The purpose of this

ethnobotany section is to show how medicinal plant knowledge of oshá should not only be looked at from a historical lens but this knowledge remains in many Indigenous communities as an important and sacred medicine.

The second chapter of my thesis focuses on the current policies the U.S. Forest Service related to medicinal plants. This federal land management agency also works with tribes in consultations and partnerships on oshá, and other medicinal plants. The U.S. Forest Service manages 818 million acres of land across the U.S (Ellersick 2015). Medicinal plants and other items that grow in the forest are part of the social, cultural, and economic lifeways of many tribal communities. Policy for medicinal plants on federal lands should continue to include the voices of Native American peoples and their concerns and their knowledge of plant management. In the policy chapter I will explain current U.S. Forest Service policies while incorporating my interviews. The purpose of this chapter is to highlight tribal values, traditional knowledge, and perspectives to help inform and influence future policies concerning medicinal plants.

Ethnobotany Introduction

Oshá (*Ligusticum porteri*), also known as bear root or *chuchupate*, is a medicinal plant that grows at elevations of 6,000 to 11,700 feet in the Rocky Mountains and Sierra Madre region in Mexico and is a perennial plant and member of the Parsley family. The range of this plant extends throughout Colorado, Utah, New Mexico, and Chihuahua and Sonora in Mexico (Fig. 1). Other closely related *Ligusticum* species occur in the American West and to Alaska. Native Americans, Hispanic peoples, and Indigenous peoples of Mexico use the root for ailments such as flu, gastrointestinal, and respiratory problems (Kindscher et al. 2013). The habitat of bear root is moist soil of meadows and in nearby groves of aspen, conifers, fir, and oak (Kindscher et al. 2013). The roots of the plant are primarily used for teas, tinctures, or salves. The leaves are also edible, have a wild carrot taste, and can be added to food dishes such as soups (Vigil 2016).

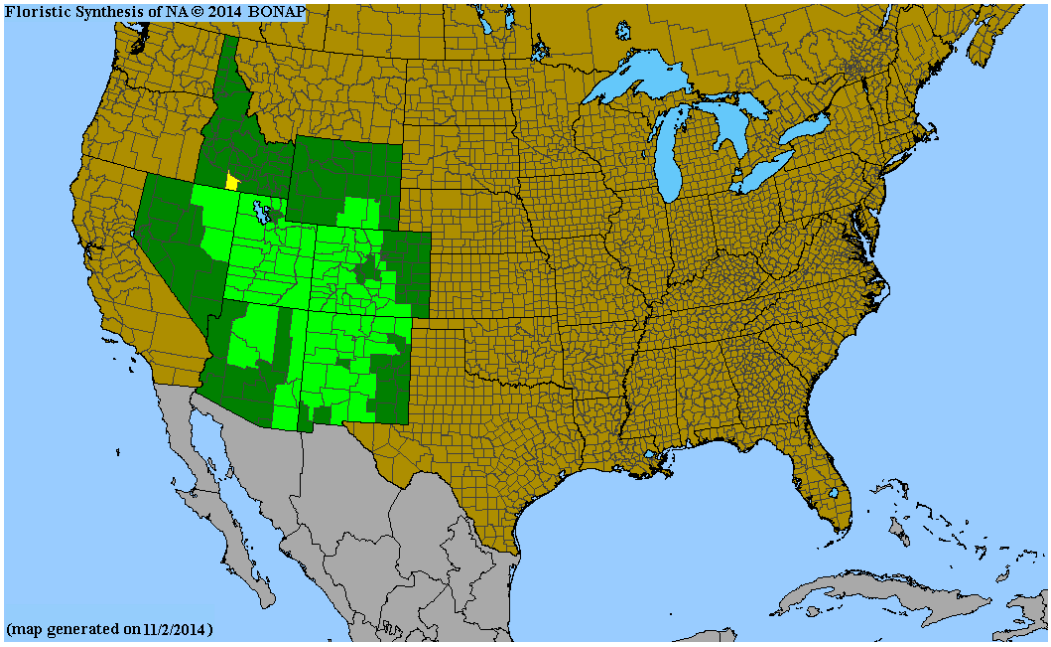

Figure 1 States that Ligusticum porteri is located in dark green; counties in light green; and yellow is a rare state occurrence (just one county in Idaho). The range extends into the Sierra Madre in Mexico, but it is not well mapped (Kindscher 2013) (Kartesz J.T. 2015).

Long traditions of plants as medicine and healing practices remains within Native Americans, Hispanics, and Indigenous peoples of Mexico. How oshá came to be called bear root

is tied to Native American cultures and stories, in which animals are highly important. There are variations to the story but all accounts involve a bear using the root. The Navajo believe that their medicinal knowledge of oshá came from observing bears eating and applying chewed up roots to their fur after hibernation (Newton and Wolfe 1992). Another source notes that captive Kodiak bears would chew, spit, and scratch the (Ligusticum) root into their fur (Newton and Wolf 1992). A researcher, Sean Sigstedt, while conducting graduate work at Harvard University, studied black bears, Kodiak bears, and polar bears interactions with *Ligusticum porteri* (Cowen 1990). Bears use the root for chewing and rubbing the paste from their paws onto their bodies (Grisanzio 1992). Oshá is an example of bears and other wild animals treating themselves with medicinal plants (Grisanzio 1992).

Healing uses of this plant are in Southwestern fiction literature, such as Leslie Marmon Silko's *Ceremony*, published in 1977 (Robinett 2003). Although Silko does not say oshá's name in the text *Ceremony*, she writes about the leaves being boiled for tea to treat an upset stomach, which is a documented use of oshá in the ethnobotanical literature. Robinett (2003) notes in Silko's *Ceremony:* "The line of healers begins with Root Woman, a name frequently given to those who deal in herbal medicine, healing, and the mysteries of birth." Southwestern fiction writers help make the link between Native American and Hispanic use of medicinal plants and help spread awareness. Silko articulates important cultural connections that tie to sacredness. Paula Gunn Allen, a Native American poet and literary critic, noted in particular that Silko's work reflects the values of the Western or White world which she describes as "learning all and telling all" (Allen 1990). The revealing of Laguna Pueblo ceremonies and telling of stories that are not supposed to be told outside the clan in *Ceremony,* makes scholars such as Gunn weary of teaching the text. This ties into the sacredness of oshá which is still a point of contention for

Native peoples today. Many tribes will not reveal where they harvest and certain tribes will not even say the Native American word for oshá because of concerns of not wanting to tell about this sacred plant (Krall 2016). Native ways frequently come into conflict with Western ways. As this plant becomes sought by more than just Native peoples, it is important that Native cultures and the sacredness of oshá be respected. In other words, the challenge will be to understand what Allen says as "know no more than necessary" which means that some knowledge is not shared with non-Natives to protect the sacredness of that knowledge (Allen 1990).

Methods

Researchers from the University of Kansas, with funding and help from the American Herbal Products Association, and the U.S. Forest Service Rio Grande National Forest and San Juan National Forest, have begun to evaluate the management of harvest of oshá. The effort has been made to study populations of oshá and assess the sustainability of oshá root harvesting for the natural products industry (Kindscher et al. 2013). The Kindscher lab has been monitoring oshá in southern Colorado at Cumbres Pass southwest of Alamosa and at Missionary Ridge northeast of Durango for the last three years. The plots studied at Cumbres Pass were in both meadow and forest habitats to compare differences in oshá populations related to canopy cover. In each plot, we counted the number of plants and the cover of those plants, recorded for the different classes of oshá: seedlings, juveniles, mature non-reproductive plants, and mature reproductive plants. The purpose of this study is to monitor post-harvest regrowth and to determine a sustainable rate of harvest for the long-term viability of oshá (Kindscher et al. 2013). Through this fieldwork, I was able to conduct interviews with those in the study region that are knowledgeable about various aspects of oshá use, harvest, history and policy.

A survey and synthesis of the ethnobotanical literature concerning oshá was conducted to determine the medicinal and cultural uses of oshá by various tribes for this review. From the gleaned information and interviews, a table was created (Fig. 2) that summarizes oshá uses and highlights the value and sacredness of this medicinal plant. Semi-structured interviews with Native American elders, a Hispanic elder, Forest Service managers, and herbal product company owner added greater depth on the correct harvest practices and uses of oshá. I conducted semi-structured interviews to allow for a space of reciprocity between the researcher and the participant (Galletta 2013). My questions were all open-ended to allow flexibility and for more conversation with the people I interviewed. For these interviews, oral history is an integral component because that is how plant knowledge and culture are passed down within Native American communities. In each interview the knowledge each participant had of oshá was expressed and room for their narrative to be developed (Galletta 2013). Native American and Hispanic participants were asked about their current knowledge of oshá, traditional knowledge, and their continued practice of this knowledge today. U.S. Forest Service managers and herbal product company owner were asked about their experience working with tribes and how medicinal plants influence their work. One elder, a Dine/Navajo ethnobotanist Arnold Clifford, from Beclahbito New Mexico, is an expert of the flora and fauna of the Four Corners region of the Navajo Nation. I also interviewed a Hispanic elder and healer, Teresa Vigil, from San Luis Colorado about her knowledge of oshá. The Forest Service managers I spoke with Angie Krall and Gretchen Fitzgerald both have experience with medicinal plant management and working with Native American tribes. Angie Krall is the Heritage Program Lead and Tribal Liaison for the Rio Grande National Forest in Colorado. Gretchen Fitzgerald is a Forester for the San Juan National Forest in Colorado. Daniel Gagnon, Herbs Etc. owner, was interviewed to learn more

about the herbal product industry's role with medicinal plant management. Daniel Gagnon is a practicing medical herbalist and herbal consultant based out of Santa Fe New Mexico. All of the interview participants are interested in the sustainable harvest of oshá project and have detailed knowledge of oshá use.

Primary uses of oshá are for stomach ailments, sickness, or the flu (Fig. 2). The root is typically boiled for a tea and for treatment of gastrointestinal ailments, headaches, and fevers (Bye 1972). Ethnobotanical knowledge from our interviews with tribal and Hispanic elders show the long-term interconnectedness between these cultures for gathering medicinal plants. The importance of knowledge is shown in these interviews, to not only learn about what medicinal plants are used for, but incorporating what specific habitats plants are found in proper times of harvest, and cultural knowledge connected to those plants. In addition to interviews, another beneficial way I learned about oshá is by participant observation where we went out and harvested oshá and learned about other medicinal plants. Harvesting techniques, collection, and processing of medicinal plants can be better shown through participant observation.

People	**Cultural and Medicinal Use**	**Reference**
Tewa Pueblo	Used to treat diarrhea and gastrointestinal problems	(Robbins, Harrington, Freire-Marreco 1916)
Zuni Pueblo	Roots used for sore throats, body aches, and curing ceremonies for illnesses	(Camazine and Bye 1980)
Cochití and Taos Pueblo	Effective in treating colds and loosening phlegm in lung infections Tea or chewed root is an anesthetic and disinfectant for sore throat Root used for disinfectant and skin wash Chewed or brewed in a tea it can cause sweating, stomach bitter, and carminative Used to ward off rattlesnakes	(Moore 1977)
Diné	Suck on the root relives a gravelly voice or colds;	(Clifford 2016)

	Used for toothaches for pain relief Pulverized with water put around Hogan's for protections against reptiles	
Yavapai Apache	Used to treat diarrhea and gastrointestinal problems	(Robbins, Harrington, Freire-Marreco 1916)
Chiricahua and Mescalero Apache	Used as greens boiled or cooked with meat	(Castetter and Opler 1936)
Mescalero Apache	Root used as a medicine drink; A mixture can be used for colds; Ground or mixed with water to rub on sore areas; Chew the root for coughs or smoke for a headache	(Hrdlicka 1890)
Plains Apache	Called "medicine fat" to describe the root; Used for smudging	(Jordan 2008)
Comanche	Carried and used for rattlesnake repellant and bites; Boiled for pneumonia	(Jones 1972)
Paiute	Used for coughs and stomach problems	(Bye 1972)
Southern Ute	Treats colds, flu, upper respiratory infections; Chewed, teas, extractions, topically; spiritual protection	(McBeth 2008)
Pima	Used roots in tea to drink for a fever	(Rea 1977)
Lakota	Used by the medicine man Used in sweats	(Bucko 1998) (Kindscher 2016)
Rarámuri (Tarahumara)	Liquid-used to treat stomach pains and flatulence, used for the common cold and fever Root carried to ward off snakes. Used for pneumonia and headaches, anthelmintic, and antibacterial Lotion for rheumatic joints, wash wounds, and as a poultice for animal bites	(Irigoyen-Rascon and Paredes 2015) (Wyndham 2009)
Hispanic	Treating colds; Loosening phlegm in lung infections; Tea made for an anesthetic and disinfectant; causes one to sweat; Bitter to help stomach digestion and flatulence; Wards off rattlesnakes and used for snake bites	(Ford 1975) (Curtin 1976) (Vigil 2016)

Hispanic	Roots are used in to alleviate pain, colic, ulcers, diarrhea, body aches, rheumatoid arthritis, broken bones, circulation problems; tea is used for analgesic, bronchitis, colds. Use in bath and apply over wounds, cuts, burns, to prevent infection	(Sãnchez 1999)
Hispanic	Root used for sore throats, gum irritations, flu, colds, coughs Ward off evil spirits and curses	(Torres 1961)

Table 1 Ethnobotanical uses of Oshá by tribal groups and Hispanics.

Native American Use

Oshá is used by many Native American tribes across western North America. While oshá root is noted by many tribes for its medicinal properties, its uses extend to more utilitarian functions around the home. The Pueblo Indians use oshá medicinally, but in addition to medicinal uses, the Pueblo found that one could also brew the root to induce sweating or cleanse their skin with the root (Moore 1977). The Pueblo Indians, among other tribes, carry the root with them or fixed it to their livestock as a form of protection to ward off rattlesnakes (Moore 1977). Pueblo Indians place the root in irrigation ditches to "inhibit" cut worms and other larvae from their crop fields (Moore 1977). The people of Tewa Pueblo regarded oshá root as being highly valuable and used the root to treat diarrhea and gastrointestinal problems, in addition to making a tea with the root. They also valued the root for trading, because it was brought from the mountains by "Mexican peddlers" (Robbins et al. 1916). L.M. Curtin's *Healing Herbs of the Upper Rio Grande* documented Native American use at Cochití Pueblo where people would chew a piece of the root about the size of a bean and wash it down with warm water to get rid of a cough (Curtin 1947).

Oshá is a utilitarian plant in Diné (Navajo) culture. When they use the root to relieve a sore throat, if one sings in the powwows the root can help relieve a gravelly voice, and they used

the root for colds and pain relief of toothaches for (Clifford 2016). To protect it, Diné people would use a powered mixture of the root around a hogan, a traditional Diné housing structure consisting of one room and in a circular shape. The powdered mixture of the root is put around the hogan, shade houses, and sheep corrals, and doing so provide protections against snakes and reptiles as it keeps them away from the living areas (Clifford 2016). Native ways of knowing and harvesting incorporate culture, religion, and stories when medicinal plants such as oshá are harvested. This is called "Native or Navajo Ecology". These ways of knowing developed by observations of plants and animals over time are intertwined with folklore and teachings (Clifford 2016).

The Mescalero Apache also use oshá for food, using the green leaves boiled or cooked with meat or the bones of animals (Hrdlicka 1890; Castetter and Opler 1936). They use medicinal preparation of the root for a cold or cough. The root was ground and mixed with water to rub on the sore part of one's body, or chewed for a headache. The Mescalero Apache were one of the first tribes to be written about for their oshá use by Hrdlicka, a Czech Anthropologist (Hrdlicka 1890). The Yavapai Apache and other tribes in southern Arizona used the root for a "stomach tonic" (Robbins et al. 1916).

Native American uses of plants were recorded by ethnobotanists that worked with tribal communities and individuals. Sanapia, a Comanche medicine woman worked with ethnobotanist David Jones on his ethnographic account of her tribe. Sanapia noted that the Comanche of present day Oklahoma, used the 'fruiting body' or seed head of oshá for medicine (Jones 1972). Sanapia noted that many old people would carry the root with them in small cloth sacks tied either on their belts or around their ankles to repel snakes. The Comanche would also chew the root to a pulpy consistency and put it over a snake bite, or a spider or scorpion bite (Jones 1972).

Sanapia acknowledged that one could boil the root into a thick broth for patients suffering from pneumonia and that the root caused excessive salivation (Jones 1972).

Native American languages are an important tool for understanding medicinal plant use, as they connect one's culture to their environmental surroundings. Native American languages have meanings and stories that connect to plants names. Authors like David Jones recorded some of the many ways Native languages describe oshá. The Mescalero Apache use the term '*itse'* when referring to oshá which Jones translates as 'mystical influence' (Jones 1972). The Kiowa Apache also use a similar word which Jones interprets as 'mystical influence' (Jones 1972). It is inferred that the Comanche may have borrowed or used this same word to describe oshá (Jones 1972). The languages used to describe oshá indicates that different tribes use the root for similar purposes.

The Zuni use oshá root for sore throat, body aches, and curing for various illnesses (Camazine and Bye 1980). The Zuni, who now reside in present day west central New Mexico, crush the root, apply it topically, and chew it (Camazine and Bye 1980). They called the root *Kwimi Dechi*, which was interpreted and translates to "smelly root" (Camazine and Bye 1980). Sometimes, Native American languages do not translate into English well, and the sacredness meaning or understanding can be lost in Western translation. These translations, 'mystical influence' and 'smelly root,' are not the most culturally sensitive word choices.

The Ute people continue to use oshá for colds, flu, and upper respiratory infections. They chew the root or make a tea, but also use the root topically as a wash, bath, or salve (McBeth 2008). In addition to medicinal use, the Utes use the root for spiritual protection and warding off evil (McBeth 2008). Further southwest, the Gila River Pima peoples from present day Arizona use oshá root for a tea to drink when they have a fever (Rea 1977). Separate from the Pima and

Ute tribes, there are other tribes that geographically vary across several hundred miles, that similarly use oshá. In addition to Southwestern tribes, the Comanche, Plains Apache, and Lakota, who live outside the range where oshá grew use this plant. The Plains Apache use oshá for smudging and the Comanche use the root for a variety of purposes mentioned above (Jordan 2008; Jones 1972). The Lakota people who presently reside in the Great Plains regions of the United States also well outside the geographic region where oshá grows, use "bear root" for ceremonies and medicinal purposes. In Lakota, the word for oshá is *mato tapejuta*, which translates to "the bear's medicine" (Schneider 2017). The Lakota people use the root similarly to Southwestern tribes for fevers, bronchitis, and headaches (Schneider 2017). The Lakota peoples burn the root and inhale the smoke to relieve headache and to eliminate sinus infections and is still used today in sweat lodge ceremonies (Schneider 2017). The medicinal and ceremonial role of bear root within Lakota cultures showcase its cultural significance. The Lakota people ceremonial usage and understanding of the plant, while living out on the Plains where it does not grow, demonstrates a vast Indigenous knowledge of both the plant and distant landscape. It could be inferred that, the Lakota peoples made it a point to either travel to locations to collect bear root or trade for it.

Indigenous Peoples of Mexico Use

The Raramuri (Tarahumara), live in the north Sierra Madre Occidental of Mexico and use many medicinal plants including oshá. The Raramuri have a special relationship with the forest and the mountains of this region (Irigoyen-Rascón and Paredes 2015) seeing themselves as members of the natural community. The Raramuri refer to oshá as *wasia* and use the word *chuchupate* (Irigoyen-Rascón and Paredes 2015).

The Raramuri value oshá for protection, to treat common ailments, and for ceremonies. The root of the plant was carried to ward off snakes, or tied around a newborn's neck to protect the infant from disease (Irigoyen-Rascón and Paredes 2015). The Raramuri chew on parts of the root as a way to push or get rid of the illness in one's system. And they crush and boil the roots for use in a lotion to treat rheumatic joints (Irigoyen-Rascón and Paredes 2015), and the lotion is used to wash wounds. Plant material, specifically the leaves, are used to cover bites from poisonous animals as a form of a band-aid. The Raramuri also drink a tea made from the roots to effectively treat gastrointestinal ailments, headaches, and fevers and a paste was made of the root for rubbing on joints to help ease rheumatism pain (Bye 1986).

Hispanic Use

Cultural customs and the use of medicinal plants are also traditions of Hispanic peoples of the southwestern United States and Mexico in the same geographic region as Native Americans. Hispanic cultures recognize another plant in the same family as oshá, that is called *oshá del campo* (*Levisticum officinale*), is cultivated in Europe apparently brought to the New World by Catholic priests. It is not a wild plant that grows in the mountains like *oshá de la sierra* (of the mountains) and is thought to be not as strong (Vigil 2016, Bye and Linares 1986). Hispanic people recognize a large portion of their knowledge about oshá use comes from Native American traditional knowledge (Vigil 2016). Not only do Hispanic people share regional similarities with Native Americans, but the role of oshá in Hispanic culture is both historically similar and still used today.

Hispanic plant knowledge has a deep history in the area of the San Luis Valley, Colorado. When Hispanic settlements were established and land grants brought workers in the 1800s Hispanics and Native Americans had opportunities for cultural exchange (Bye and Linares

1986). In Hispanic communities, oshá harvest is linked to religious days of observation. Oshá harvest aligns with two Catholic feast days: el dia de Santiago and el dia de Santa Ana linking together religion and medicinal plant use for Hispanic peoples (Bye and Linares 1986). On August 10th each year, the feast day of San Lorenzo marks the gathering time for oshá. This gathering time ensures that oshá is not harvested too early, demonstrating that Hispanics view oshá with the upmost respect and treat the plant properly to ensure its reproduction (Vigil 2016). Harvest practices today continue in that tradition where oshá is not collected until the feast day of San Lorenzo in August (Vigil 2016). Though the tradition is spiritually based, and a blending of Indigenous and Western understandings, suggests the historical importance of having a supply of mature oshá for the winter months.

Hispanics use oshá as a remedy for common ailments such as sore throats, gum irritations, flu, colds, coughs, and for the skin (Torres 1961; Sãnchez 1999; Linares and Bye 1987; Moore 1990). Also, they grind the root, chew the root for stomach ailments, and carry the root with them to keep away snakes (Ford 1975). For bites, Hispanics mix the root and water and apply it to draw out the poison (Curtin 1947). An ointment made from the root was used to treat cuts, sores, and bruises. And a root tea was used for various ailments such as stomachache. Additional ways Hispanics use oshá are for tea are grinding the root into a powder for colds, coughs, flu, and pneumonia (Curtin 1947). Today the root is still pulverized to make a powdered form to clear the lungs (Vigil 2016). The leaves of the oshá plant are used to season soups to treat colds. (Curtin 1947; Vigil 2016).

Current Use and Recent Research

Native American tribes, Hispanics, and Indigenous peoples of Mexico continue to use oshá. Oshá today is also harvested in the wild and sold by herbal product companies. Products

that utilize oshá have been said to be one of the most successful items that some herbal product companies sell (Gagnon 2016). Medical herbalists are aware that the public is using herbal products for their health, to promote or maintain a healthy lifestyle, or as a solution to health issues (Gagnon 2016). The main commercial use of oshá is for the treatment of bronchitis, influenza, and other respiratory illnesses (Jackson and West 2004). With continued use by Native American tribes, Hispanic peoples, and Indigenous peoples of Mexico, and the 'growing popularity' in herbalism, oshá is being harvested more in accessible areas (Jackson and West 2004). Generations of harvesters continue the practice of harvesting and collecting oshá and smaller herbal product companies deal directly with pickers or harvesters who rotate their harvest locations (Gagnon 2016). The American Herbal Products Association data collection show that wild collection and demand for *L. porteri* has increased since the late 1990s and has remained constant (Turi and March 2011). Regulations on harvest or learning more about the harvest levels of oshá are important to ensure sustainability and ethnical harvest practices. In addition to the use in herbalism, research on the chemistry of oshá, specifically on the chemical qualities of the root has been conducted. Two major medically active phthalides in the oshá, Z-Ligustilide and Z-6,6′,7,3′- α-diligustilide, have been extracted and studied (Rivero et al. 2012). Chemistry research is important for providing scientific support for the use of oshá for future medical use (Kindscher et al. 2013).

Discussion Ethnobotany

Native American tribes, Hispanic communities, and Indigenous peoples of Mexico Communities are continuing their cultural traditions surrounding plants that is directly tied to the landscape. An important use for oshá is for medicine, protection, and other ailments. Knowing the history of use for medicinal plants can help inform future management policies. The history

of use of oshá can bring together tribes and researchers for land management strategies that use more Indigenous knowledge systems as part of their practices. Traditional knowledge is important for understanding the variety of uses of oshá. This plant continues to be highly valued today by Native American peoples, Hispanic peoples, and Indigenous peoples of Mexico. The many uses are good but might affect future populations. Herbal product company owner Daniel Gagnon spoke highly of the plant being used as an herbal medicine. Elders, such as Arnold Clifford and Teresa Vigil also supported its importance as a medicine from their perspectives. Future research should focus on ways to both use oshá and use it sustainably. The focus of Indigenous peoples caring for the land, although by colonial infringement that ended up harming the land, has not stopped medicinal plant knowledge from continuing to be learned and taught. Medicinal plants are tied to land and hold a deep cultural importance that has continued today.

Policy Introduction

Plants and plant materials are gathered by people all over the U.S. including on federal lands which are home to a diversity of plant species. Within Native American communities, many medicinal plants are important for cultural and spiritual uses and contribute to the identity of many cultural groups. People from diverse backgrounds, such as different ages or cultural groups, including Native American tribes (McClain and Jones 2005; McClain and Jones 2002), harvest medicinal plants. We can trace the history of Native American peoples' use of medicinal plants to healing herbs such as goldenseal (*Hydrastis canadensis*), echinacea (*Echinacea spp.*), and American ginseng (*Panax quinquefolius*), the properties of which Native Americans passed to European missionaries, pioneers, and settlers who used this information for traditional American medical care (Anderson 2005; Anderson 2016).

Mainstream society has embraced the benefits of medicinal plants, which has led to an increase in demand. Harvesting by both commercial harvesters and cultural groups indicate there are interrelated social and economic issues at stake (Pilz et al. 1999). For example, Daniel Gagnon, an herbal product company owner, knows that herbal product knowledge is passed down generation to generation, and the interest in herbal products is continuing (Gagnon 2016). Organizations like the United States Forest Service regulate the harvest of some medicinal plants that are used to make herbal products. One potential downfall is overharvesting. For example, American ginseng (*Panax quinquefolius*), a wild-harvested medicinal plant species, is overharvested due to its variety of uses in traditional medicines (McGraw et al. 2010). American Ginseng is one example of a medicinal plant that has been exploited for its value. If harvest levels of the roots are not watched or regulated, this kills the plant, harming the plant itself. As a result, the Convention on International Trade in Endangered Species of Wild Fauna and Flora

began to monitor, control, and restrict the international trade of ginseng in 1973. These regulatory measures, however, have not been strictly enforced (McGraw et al. 2010). The U.S. Forest Service and other federal agencies follow this same convention agreement by having state-to-state regulations, which require each state to make sure ginseng roots are legally harvested. Even with state regulations in place, there is still a lack of widespread monitoring for ginseng populations due to a lack of funding and the difficulty of obtaining harvest rates and frequency (McGraw et al. 2010).

Oshá (*Ligusticum porteri*) is a medicinal plant that grows at elevations of 6,000 to 11,700 feet in the Rocky Mountains of the United States and the Sierra Madre region in Mexico and is a perennial member of the Parsley family. The root is used by Native Americans and Hispanic peoples for ailments such as flu, gastrointestinal, and respiratory problems (Kindscher et al. 2013) and is one example of a medicinal plant that can be harvested from the wild. Historical evidence demonstrates Native American tribes have used bear root for years, and they continue to do so today. Due to the lack of commercial permits for oshá, herbal companies have begun using other plant species in place of bear root in their products (Gagnon 2016), a shift that may put pressure on the ability of Native peoples to continue harvesting oshá. Gagnon notes that regulations for oshá will happen as this plant continues to gain more popularity, more people will want it (2016). If restrictions are placed on oshá it should not stop Native American and Hispanics from continuing to harvest, what they have been doing for hundreds of years (Gagnon 2016).

The increase in harvesting of medicinal plants coincides with the harvest practices Native Americans still use today. Native Americans have a history of use and management for medicinal plants that is sometimes overlooked by federal land management agencies. Medicinal

plants are integral for Native American teachings about the environment and their own conservation practices. For example, Arnold Clifford, a Diné ethnobotanist, learned about plants from his grandmother and through Navajo teachings called 'Native or Navajo ecology,' which distinguish parts of the plant and their habitats (Clifford 2016). The plant and animal observations generations of Native Americans pass down are representative of Indigenous science intertwined with folklore types of teachings (Clifford 2016). Clifford's knowledge about the environmental conditions necessary for the harvest of bear root incorporates what surrounds the plant, such as streams or the forest. His grandmother would collect bear root and other plants in the understory of aspens and oak shrubs in the forest and left the bear root growing along the water ways alone because poison hemlock grew near the waterways, and that is a poisonous plant that looks like oshá (Clifford 2016). This example of harvest practices shows a valuable and sustainable ecological understanding of the environment Clifford's grandmother managed. Clifford's grandmother's specific cultural knowledge could increase sustainability for oshá. Developing an Indigenous focused policy that incorporates the experiences and knowledge Native peoples have with medicinal plant harvest would help with management practices today. In this paper, I will examine potential areas of collaboration between Native tribes and the Forest Service to create more Native-focused policies for medicinal plants.

Methodology

I conducted interviews and synthesized the policies on medicinal plants after thoroughly researching existing policies on the harvest of medicinal plants on U.S. Forest Service lands. I looked at these policies for information of the medicinal plant management on federal lands. This paper also builds on an interview project of semi-structured interviews with Native American elders, Hispanic elders, Forest Service managers, and Herbal Product Company on correct harvest practices and uses of oshá. Native American and Hispanic participants were interviewed about their current knowledge of bear root, traditional knowledge, and the continued practice of this knowledge today. Each interview was more of a conversation rather than formal interview where I would discuss things about oshá with each participant. I was able to observe one traditional harvest with Arnold Clifford. We went to the Chuska Mountains in Arizona and New Mexico region and harvested bear root and learned about other medicinal plants important in Diné culture. After my fieldwork, I transcribed and looked for topics or themes found in each interview. Interviews are important for informing and shaping future policy directions around medicinal plants for Indigenous peoples. U.S. Forest Service History and Policy related to Native Americans

Historically, the U.S. government removed Native American tribes from their traditional homelands onto smaller areas of land, today known as reservations. In many cases, tribes "agreed" to move only if they still had the ability to harvest resources on their traditional homelands. These rights were included in treaties as "off-reservation" rights, and those rights gave Native tribes the abilities to engage in traditional grazing, fishing, and gathering practices on current National Forest lands and would give access to medicinal plants like oshá (Goodman 2000). Even with protected access to traditional homelands that are now National Forest lands,

tribes are sometimes not able to practice reciprocal environmental relationships due to land appropriation and colonization, and some of those traditional practices with the land are no longer practiced (Clifford and Orozco 2014).

Along with westward expansion, the United States also began a process of industrialization of timber in National Forest System lands. The growth of the national lumber movement subsequently led the forest conservation movement to manage timber production. As lands were being transferred into the National Forest System by President Roosevelt's proclamation, this policy also targeted tribal forests. About seven Indian Reservations with tribal forests were then 'transferred' into the U.S. Forest Service system (Catton 2016). The idea that Indian forest resources needed to be brought under public ownership and that the government would have the full authority of distributing those resources created further separation between tribal peoples and the U.S. Forest Service. At the end of the 19th century, a foundation had been made for the U.S. Forest Service to continue to manage this forest system, with little room for Native land use practices.

The Forest Service has overlooked tribal rights to plant, forest materials, hunt and fish. For example, in the case *United States v. Washington* (1974) the court ruled favorably for the tribe's treaty rights and allowed the tribes of the Pacific Northwest region to continue their right to fish stated in the 1854 treaty (Catton 2016). Before this, the U.S. Forest Service was allowing timber sales on lands where the Klamath tribes still exercised their hunting and fishing rights (Goodman 2000). This case represents an example of a lack of recognition and communication by the Forest Service to consult with tribes before allowing commercial timber harvest on areas where the Klamath tribes have treaty rights. The government-to-government relationship and consultation the Forest Service has with tribes failed to recognize treaty protections tribes have

with natural resources. The rights reserved in treaties and the ability to harvest on federal lands are important to Native American tribes and should still be upheld today. The environment plays a pivotal role in Native American lifeways which requires further protection and continued communication with the U.S. Forest Service.

Other legislative actions and executive orders have also reaffirmed harvest and gathering rights granted in treaties. During the Clinton administration (1993), an executive order in the Farm Bill allowed for Native Americans who are members of a federally recognized tribe to harvest medicinal plants and other forest items on federal lands (United States Congress 2009). Forest Service manager, Gretchen Fitzgerald, explained that this order allows tribal members to collect forest products for cultural and traditional purposes for free, if it is not for commercial purposes (Fitzgerald 2016). This recognition in the Farm Bill has allowed for professional relationship development between tribes and the U.S. Forest Service. Laws like the Farm Bill recognize harvest rights for Native American tribes, which allows for increased use of these federal lands for medicinal plant harvest. It also creates opportunities for tribes and their communities to harvest medicinal plants that may not grow on their reservation lands. Tribes have more of a voice communicating with the Forest Service on medicinal plant harvest for personal use and the cultural importance of these plants.

Today, with the Forest Service and Native American tribes, a one-to-one relationship matters most, in addition to continuing to work with tribes. The potential of the agency-tribe working together is starting to happen. The San Juan and Rio Grande National Forests in southern Colorado have managers who have started relationships with tribes that surround the national forests or have historical ties to those forests. Angie Krall, a Forest Service Archeologist, describes her relationship with Native Americans and Hispanic peoples by

working with them and learning about their methods for harvesting bear root. For example, she has learned from a Hispanic elder, Teresa Vigil, that she collects oshá after the feast day of San Lorenzo because that is when all the energy goes down into the root and the plant turns yellow, indicating it is mature enough to harvest (Krall 2016). From the exchange between Angie Krall and Teresa Vigil, Teresa Vigil was invited by Angie Krall to show and teach other researchers and Forest Service managers her harvest methods for bear root. Teresa Vigil was able to create a culture shift, meaning that Forest Service personnel began to learn more about cultural ties to plants, because of the cultural connections tied to harvesting as well as using bear root for medicine.

Timber vs Non-Timber Forest Products and What that Means for Oshá

Policy created by the U.S. Forest Service in 1910 that laid out the guidelines for timber harvesting within National Forests. Timber management was one of the first specified management goals for national forests (Baker et al. 1988). *The National Forest Manual,* published in 1911**,** discussed timber sales and regulations and detailed things such as how much timber to harvest and what represented a sustainable yield for timber harvest (Baker et al. 1988). After timber was clearly laid out in management plans, the Multiple Use-Sustained Yield Act of 1960 expanded uses in the National Forest System because demands were shifting to more than timber harvest, such as outdoor recreation, range, timber, watershed, wildlife, and fish purposes. The U.S. Forest Service began to focus more on other parts of the forest including a few policies that included medicinal plants.

Medicinal plants and other materials in the forest that are not timber can be defined using different terms, such as non-timber forest products. The Forest Service and United States Department of Agriculture use forest botanical products or special forest products (HR 2466

1999) to define non-timber, non-timber forest products is the more common term (Chamberlain et al. 2001). There are many different parts of the forest that are classified under non-timber forest products besides plants, it ranges from fungi, herbs, shrubs, and trees. There are different uses for these materials such as for food, medicine, floral, and decorative purposes. Scholars started using the term non-timber forest products in the 1980s (Ahenkan and Boon 2011). In part, they began using this term due to the shift to include other forest products besides timber in research and management. The Forest Service began passing policies and guidelines to manage and monitor non-timber forest products in 1999.

The Forest Service has created policy initiatives for plant materials other than timber. It established a pilot program to manage Non-timber Forest Products (HR 2466 Section 339) in 1999 with the tasks of assessing value and establishing buying procedures for fair market value (Chamberlain et al. 2001). This Bill also requires the Secretary of Agriculture to determine the sustainable harvest levels and methods, while also establishing a procedure for monitoring and revising harvest levels. In addition, in 2001 a policy called the "National Strategy for Special Forest Products" was created to guide the U.S. Forest Service for managing Non-Timber Forest Products, which included medicinal plants. Some of the goals for management in this policy were to ensure availability of non-timber forest products, integrate Non-Timber Forest Products into forest management, and inventory and monitoring of resources (Chamberlain et al. 2001). The Forest Service began discussing Non-Timber Forest Products separate from timber in its policies, and oshá would fall under this policy. These initiatives represent good progress toward specific policies for resources other than timber, but future policies should address the cultural component of non-timber forest products, commonly referred to as medicinal plants.

The Term Non-Timber Forest Product

Native Americans value the forest different from Western management strategies. Those values were not always included or incorporated in the realm of forest management. The idea of humans being 'managers' of the land is a Western construct, instead Natives view themselves instead as caring for the land. Native Americans have been harvesting medicinal plants and other forest materials since time immemorial and continue to do so today. Indigenous peoples need to be included in future forest management policies and practices. Traditional harvest practices and cultural and religious values are tied directly to medicinal plants that have been referred to as non-timber forest products. The use of the term non-timber forest products is too broad, which is problematic because it does not bring in the social and cultural factors important with medicinal plants. The term non-timber forest products allows policies to be made in a blanket way and does not incorporate ecological, economic, and social factors into management strategies. Each interviewee uses the term medicinal plants. In my interviews, no one uses the term non-timber forest products. Academic journals and federal publications, where the term non-timber forest products are used, treat oshá as other non-harvested material. The Forest Service should better incorporate the needs and values of Native American communities through specific policies for medicinal plants. It is important to include culture and religious values of medicinal plants to make policies more inclusive. On a smaller scale, Forest Service managers have begun to work with Native Americans in regards to medicinal plant harvest practices.

Forest Service managers are responsible for the regulation of small scale medicinal plant harvesting. The U.S. Forest Service uses personal use permits to track medicinal plant harvest by individuals to help the agency also track plant populations. In practice, it is a free permit that allows people to collect plants for their personal use if they do not sell them commercially (U.S.

Forest Service 2011). There has been illegal harvest of oshá. Specifically, Diné peoples were caught on Forest Service land with a truckload of oshá to sell on the powwow circuit (Kindscher 2016). Other groups of individuals have been caught illegally harvesting oshá for commercial use (Krall 2016). Additionally, some Native Americans do not believe they need personal use permits since they have knowledge—passed down from generation to generation—of local plants (Clifford 2016). Requiring Native Americans to hold permits can represent a barrier to access for tribal members attempting to harvest natural resources on federal lands (Dobkins et al. 2016). Requiring permits can be difficult because of possible lack of transparency with gathering permits, specifically with the process of obtaining the permit and where that person would be allowed to gather, that have happened in the Pacific Northwest Region of the United States (Dobkins et al. 2016). Even with permits, not all Natives would be in agreement because permits infringe on their sovereign rights and religious rights, and permits require that you be a member of a federally recognized tribe. Historically, contracts such as treaties that allow for harvest on current Forest Service land were not always honored or followed. Current Forest Service officials today do not always fully understand or acknowledge the tribal histories with treaties and the lack of trust Native peoples sometimes have with federal agencies. The multiple entities that control use of Forest Service lands make it difficult to navigate bureaucratic permitting systems. Paired with an increased volume of harvesting from the herbal product industry, tribal members face increasing difficulties to gather resources like medicinal plants (Dobkins et al. 2016). The multiple variables with harvesting today can lead to a strain on what is available to harvest or infringe on relationship building between tribes and the U.S. Forest Service.

Even with drawbacks, initiatives within the Forest Service are working to strengthen and build relationships with tribal communities. The Office of Tribal Relations, formed within the

Forest Service in 2004, encourages consulting with Native American tribes around policy development and working effectively with tribal governments. This office serves as the single point of contact for tribal issues and centers on programs that developed with consultation with Native American tribes (Catton 2016). This initiative helps create increased effectiveness in Forest Service programs for tribes, while working towards consultative and joint relationships with tribal governments through new policies (Catton 2016). The office is a promising feature for Native American tribes because it would be able to focus on cultural and natural resource matters important for Native peoples. For policy, the Office of Tribal Relations can prepare and implement new and existing policy and highlight opportunities for tribes to work with the Forest Service. This office welcomes new opportunities to work with tribes on policy initiatives that would help improve tribal Forest Service relations. The Forest Service can better protect medicinal plants such as oshá by incorporating Native American perspectives, especially their knowledge and value systems around medicinal plants.

Examples of Other Management Plans in Conversation with Native American Tribes

The Forest Service and Native American tribes have come up with strategies to manage and preserve other parts of cultural heritage. The Obama Administration established two culturally important areas as National Monuments, Chimney Rock National Monument and Bears Ears National Monument. Policy for national monument designation dates to the Antiquities Act, passed in 1906, which legally protects cultural resources and requires federal agencies that manage these public lands to protect and preserve them (Hartman 2011). Bears Ears in both southeastern Utah and southeastern Nevada is 1.64 million acres of protected lands sacred to tribes such as the Navajo and Ute. The protected landscape is used for ceremonies and allows for the continuation of harvest of important medicinal plants (United States Congress

2016). Bears Ears monument designation will ensure continued tribal access to these lands for cultural, medicinal, and spiritual purposes. The Chimney Rock National Management Plan, with the San Juan National Forest, located within Southern Ute's Reservation, is a strategy that guides and protects land stewardship that works with tribal groups, such as the Pueblos. Like Bears Ears, Native peoples consider Chimney Rock to be a culturally important area and an area where materials are gathered for food or medicine. The U.S. Forest Service worked alongside tribal peoples to create a land management plan that represented tribal interests and considered multiple factors, such as spiritual significance, harvesting, and hunting rights (Khung 2015). This management plan is meant to serve as direction and guidance for future management that include scientific and historic objects of the Monument. The plan requires and provides guidelines for the proper treatment of these cultural resources, reinforcing their importance. Including the importance of protecting the cultural and social importance of these sites ensures that responsible land management practices will be followed. These management plans for national monuments like Bears Ears and Chimney Rock protect these important cultural landscapes for Native American tribe's future use.

The Pacific Northwest region of the United States has a history with non-timber forest product harvest, specifically with the American Matsuake (*Tricholoma magnivelare*) industry, but the Forest Service has included harvesters' knowledge in making management plans (Pilz et al. 1999). For example, the Winema and Deschutes National Forests worked with harvesters, who were recent immigrants from Cambodia, Laos, Thailand, and Vietnam, to create a program around American Matsuake harvest, and included things such as harvesting techniques, sizes of mushrooms, areas off limit to collections, and protection of archeological sites (Pilz et al. 1999). The Pacific Northwest region is also an area with culturally important species to many tribes in

that region. This region is an example of Forest Service research-led initiatives for medicinal plant management. For example, the American Matsuake (*Tricholoma magnivelare*), Western red-cedar (*Thuja plicata*), and edible red layer seaweed (*Porphyra abbottiae)* are some examples of culturally important species used in this region by tribes. In addition to cultural uses, Forest Service lands in the Oregon Cascades are used for commercial and recreational purposes, among others (Pilz et al. 1999). Forest Service timber manager Gretchen Fitzgerald, who works in the San Juan National Forest in Colorado region, looks at Pacific Northwest policies for guidance for the San Juan's own non-timber forest product policies because the Pacific Northwest has been working with medicinal plant management for a long time (Fitzgerald 2016). Agency-harvester partnerships are one way in which areas like the Pacific Northwest and those where oshá grows can address increased harvest. Agency-harvester partnerships are starting to happen in the Pacific Northwest area of the National Forest System. Harvesting activity brings opportunity for what is known as "agency-harvester collaboration," which is the development of materials for forest managers using traditional ecological knowledge as training in how to communicate in mutually understandable ways with non-timber forest product harvesters (McClain and Jones 2002). Traditional ecological knowledge has multiple definitions but centers on traditional ecosystem knowledge used by Native peoples to influence their management practices (Berkes et al. 2000). Collaborative relationships with harvesters offer progress on harvest, awareness of what products or plants are desired commercial, data collection, areas that are over gathered, and feedback on availability and conditions (McClain and Jones 2002). The idea of having mutually beneficial collaborations with harvesters within the U.S. Forest Service, including those that harvest from Native American communities and Forest Service personnel, utilizes cross-cultural communication that varies between groups. Continued development and education on Native

American traditional plant knowledge with the Forest Service is an important step for monitoring and managing medicinal plants on federal lands.

Shifting Cultural Identities around harvest of Medicinal Plants

The management methods used by the Forest Service for medicinal plants is changing because of Native Americans and Hispanic peoples continued use of medicinal plants. Suggestions by Teresa Vigil who would want to see low-income communities that surround areas where oshá grows be involved in the harvest. She said oshá seems to grow near poorer or low income areas where companies are coming in to harvest. Instead, she would rather see people who live in these areas paid to harvest oshá (Vigil 2016). On the other hand, Angie Krall has the opposite viewpoint from Native American communities. Discussion around commercial harvest of medicinal plants as a source of economic income was brought up in an annual meeting Forest Service Archeologists had with tribes in 2011. Herbal product companies would like ethically collected oshá and talked about the idea of tribes being paid for harvest. The elders were not supportive of this idea of harvest for economic development for tribal people, and they shut the idea down. Native American tribes believe that oshá is too sacred to be harvested commercially (Krall 2016). In conversations with elders, Angie learned if bear root is harvested commercially, it will lose its power (Krall 2016). Forest Service managers such as Angie Krall want to work with Native American communities to actively manage medicinal plants to protect them. The differences with cultural identities also indicate that the Forest Service and Native peoples have different visions of the forest (Dobkins et al. 2016). Working towards educating non-Natives on the Natives' point of view will promote better understanding of cultural importance of plants such as oshá. Understanding the cultural importance of medicinal plants is important for viewing them as not only a resource, but also as part of cultural lifeways.

Indigenous Conservation Principles

Public Land Agencies, like the U.S. Forest Service, work to preserve ecosystems, in addition to now including human effects and cultural practices. Cultural practices, known as 'Indigenous conservation principles,' hold ecological information that can inform land management strategies around medicinal plant harvest. Indigenous conservation principles are made up of features such as historical ecological information, traditional knowledge, land use ethics, and awareness of community ecology and respect (Anderson and Moratto 1996). There is value for land managers continuing to understand the detailed methods of how and why Native peoples shaped ecosystems. It would lead to more inclusive management methods (Anderson and Moratto 1996). The literature documents several traditional harvest practices. For example, the quantity taken does not exceed the biological capacity of the plant population to regenerate or recover, and different norms or social constraints are in place to discourage depletion or over exploitation (Anderson and Moratto 1996). These traditional harvest practices and methodologies for working with plants has not always been accepted by agencies such as the Forest Service. Barriers to harvesting, such as requiring a personal use permit, and a lack of understanding of these traditional resources infringe on the ability of one to have a relationship with the land (Dobkins et al. 2016). Native Americans rely on the land, and the ability to harvest from the land and to practice traditional ways of plant gathering is imperative to cultural continuity on these federal lands.

Arnold Clifford's knowledge of Native land management practices that incorporate recognizing the leaf shape of plants and lower elevation growing plants used as medicine have been imperative for his learning. Specifically, for oshá, he noted it is important to learn color and structure of roots, smell, and leaves in order to distinguish features so you can identity other

plants, such as poison hemlock, that grow along the waterways with oshá and not collect them (Clifford 2016). Arnold Clifford learned botany from his grandmother, who taught him to recognize the roots and smell and understand root structure to distinguish biscuit roots from oshá. Arnold Clifford and other Native peoples were taught to only harvest what you need. Selective harvesting can lead to reproduction of the plant population, and cultural rules and norms are an important part to Native medicinal plant practices. Arnold Clifford practiced these traditions with his grandmother and is now passing those traditions down to the younger generation to continue these plant interactions. Incorporating more traditional knowledge and conservation principles into official policy allows tribes a continued relationship with plants and other forest resources used culturally on federal lands. Indigenous conservation principles are not only a theory, rather these principles should be incorporated in U.S. Forest Service natural resource strategies like plant management.

Education as a Tool to teach Indigenous Conservation Principles

Despite partnerships and programs between the Forest Service and Native American tribes, bureaucracy within the Forest Service still has its short comings. Arnold Clifford noted that he is re-explaining the importance of Native harvest often because the Forest Service changes people in their positions every few years. To compensate for this, having a yearly training program for the Forest Service on Native American environmental knowledge and management strategies would prevent the need for Native Americans to constantly justify environmental practices (Clifford 2016). Opportunities for educating Forest Service managers on Native uses of plants and harvest was an important point many of my interviewees brought up. Many of the people I interviewed spoke about the need to educate or suggested alternatives for medicinal plants, such as using oshá once or twice a year and having a policy that discusses

collecting native herbs. “Native Americans should have first right and use for plants because our holy deities are the ones who created plants” (Clifford 2016). Arnold also pointed out that allowing Natives the chance to speak in these agencies would incorporate more Native concerns into policy and decision making (Clifford 2016). Native American issues are often off the radar because scientific knowledge is often looked at as being the only source of information, and Native American management practices are looked at as being in the past. There are ways to promote more Native management practices, such as the tribal liaison positions within the Forest Service. Tribal liaison positions are a way to have continued opportunities for engagement with Native American tribes. These positions offer a bridge between research and questions the Forest Service is doing with knowledges tribes have about natural resources. The Native American Grave and Repatriation Act of 1990 (NAGPRA) requires federal agencies, state and local museums, and educational institutions that receive federal funding to repatriate human remains, funerary objects, sacred objects, and objects of cultural patrimony to tribes (Catton 2016). With NAGPRA, tribes also requested access to National Forest lands to rebury ancestors on ancestral homelands. Forest Archeologists continue to consult with tribes regarding sacred places, which include conversations on protecting medicinal plants.

Discussion Policy

Medicinal plant use is a part of Native American cultural identity and is guided by cultural rules and sophisticated knowledge of ecosystems. As policies and laws are changing to include Native peoples’ cultural heritage, collaborations between Native American tribes and the U.S. Forest Service are encouraging. Today, U.S. Forest Service land managers are working with Native peoples to address cultural resources and values in management strategies, such as medicinal plants. Continuing relationships between Native American communities and the U.S.

Forest Service are important for upholding the trust relationship federal agencies have with tribes.

I would suggest greater collaboration between the tribes and U.S Forest Service, especially to establish a more specific framework on medicinal plants on federal lands. It is not universal to have Forest Service managers, like Angie Krall and Gretchen Fitzgerald, in each agency to work with tribes. With the Forest Service managers I talked to, in some cases they had reached out to tribes to ask for their input on forest products. Having more focus at each National Forest for meaningful consultation on the areas of tribal importance, including medicinal plants, for management strategies is crucial to adhering to tribal rights. Decreasing barriers like permits for medicinal plants and other materials is important so that tribes can continue to practice their religious rights. Many tribes use medicinal plants, including oshá, harvested on federal lands for food, medicine, and ceremony.

Forming an education plan is another area that could be implemented within the U.S. Forest System and other federal land agencies. Much of the history of the U.S. government's relationship with Native peoples is not readily taught or known within federal agencies, specifically regarding land ownership and historic changes to the land. Education around tribal sovereignty, trust relationship, and tribal histories can foster a deeper understanding for employees of the U.S. Forest Service (Dobkins et al. 2016). An education plan would also be beneficial for the herbal product companies that use medicinal plants for their products. If herbal product companies understand the history and continued use by Native peoples of medicinal plants, it could help deepen their knowledge of these same plants as well. In my interviews and conversations with elders, almost all of my participants discussed the importance of education. Incorporating Native American concerns into policy and providing more positions for Natives in

the Forest Service and opportunities to help make decisions are two ideas participants brought up in interviews that could improve relationships with tribes (Clifford 2016). Much of the policy that exists for medicinal plants comes from a management perspective. Agencies like the U.S. Forest Service continue to use the word management which differs from the Native way of using medicinal plants. Lastly, developing a cooperative management plan that includes cultural knowledge of Native peoples ensures a commitment to recognizing human interactions with the environment and is key for sustainably managing medicinal plants like oshá.

Continuing these conversations around Native American-focused policy is important as Native communities are revitalizing their cultural traditions surrounding plants such as oshá. To move forward, the Forest Service, herbal product companies, and Native American tribes must come up with goals to address management strategies. Based on historical information, development of policies and laws, and the management of what are called non-timber forest products, continued integration of both environmental and Native American-based policies would be an important step. Future research in this area is needed to continue examining how to create culturally relevant policy, address barriers to harvesting medicinal plants, and foster opportunities for co-management between the Native American tribes and the U.S. Forest Service.

Conclusion

In this thesis, I have analyzed and synthesized the ethnobotany of oshá and the current policy of medicinal plant harvest of U.S. Forest Service lands. To do so, I conducted interviews with Native American elders, a Hispanic elder, U.S. Forest Service managers, and a herbal product company owner and incorporated parts of the interviews in my thesis. The parts that were included from the interviews and support from the literature were traditional plant management and plant knowledge, management methods for medicinal plants, and what the future relationships between the U.S. Forest Service and Native American tribes should look like. Understanding the intersections between the ethnobotany of oshá and the policy of medicinal plant management was the goal of this thesis. Ethnobotany points to the strong relationship tribes have with oshá and helps to further support policy that reflects the needs of Native communities and their relationship with medicinal plants. Federal policy that reflects the values and concerns of Native peoples around medicinal plants will strengthen relationships between the U.S. Forest Service and Native American tribes.

Beginning with ethnobotany I gathered and analyzed literature sources on the medicinal plant oshá used by fifteen different Native American tribes, Hispanic peoples, and Indigenous peoples of Mexico. The ethnobotany both historical and more recent offer valid and current plant knowledge on how oshá is used today. Medicinal plants like oshá are a part of the revitalizing culture and traditions within Indigenous communities for medicinal plants. Oshá and other medicinal plants have a long history of use within Indigenous communities, fifteen tribes were documented in the table (Fig. 2), and more tribes likely use oshá, especially in and near the range of the plant. Plant knowledge is fluid, evolving, and becoming more ‘mainstream’ but it is important to acknowledge where this knowledge comes from and remains within these

Indigenous communities. Indigenous knowledges in ethnobotany can inform Western ways of knowing to inform practices used in natural resources strategies today. From the literature and interviews it is apparent that oshá use continues to be valued in many Native American, Hispanics, and Indigenous peoples of Mexico communities. For example, the use of the plant to protect one's home, livestock, and for common ailments such as the flu affirm the importance of this plant for all aspects of one's life. Medicinal plants are part one's culture and way of life, medicinal plants such as oshá are held with the upmost respect for their variety of medicinal and cultural uses.

Next I analyzed current U.S. Forest Service policies on medicinal plants and discussed ways in which future policies can include Native American voices from my interviews. For example, the Farm Bill law is one example of how policy created more opportunity to allow Native Americans, free of charge, access to forest materials like medicinal plants for ceremonial and cultural purposes. Some Forest Service managers like Angie Krall and Gretchen Fitzgerald, whom I interviewed, have good relationships with tribes that surround the San Juan and Rio Grande National Forests. Continuing the work between Forest Service managers and Native American communities will create further understanding and advance the cultural values around medicinal plants and influence future management strategies. Working with Native American communities and medicinal plants can help the U.S. Forest Service to make sure that Native American tribes are key stakeholders in future policies and programs (Ellersick 2015). Having these partnerships with Native American tribes acknowledges the history of these lands and Native peoples relationships to them.

Another opportunity in the policy chapter discussed education initiatives within the Forest Service that focus on traditional ecological and plant knowledge and history of Native Americans and National Forests. The idea of more education was brought up in all of my interviews and stressed especially by the elders I interviewed. The inclusion of Native American perspectives in the U.S. Forest Service will aid in continuing partnerships with Native peoples and effectively address trust relationships the Forest Service have established with tribes (Ellersick 2015). Education programs and trainings could help shift perspectives and create a deeper understanding of the meaning of the forest to Native peoples within federal land management agencies like the U.S. Forest Service. My policy chapter shows that the U.S. Forest Service continues to have opportunities to move forward in a positive way.

Both ethnobotany and policy serve important roles in medicinal plant management today. The field of ethnobotany brings forward strong medicinal and cultural uses of many native plants Native Americans use to this day like oshá. U.S. Forest Service policies on medicinal plant management could benefit from more culturally relevant policy in which it is aided by the study of cultural and medicinal plants, ethnobotany. For the medicinal plant oshá, it's documented ethnobotany continues with fifteen Indigenous groups and more recent use in herbal supplements. Both point to a strong knowledge base and use of this plant that warrants management strategies to address both these factors. While discussing ethnobotany and U.S. Forest Service policies, more research in this area should continue to ensure improvements in future policies. The environmental and plant knowledge in Native American communities shows how important of a role Native peoples have in our future policies.

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